

Claims

- [c1] An electronic display comprising an electro-optic material having a plurality of pixels, and separate first, second and third sets of addressing means for addressing said pixels, each of said pixels being associated with one addressing means in each of said three sets, such that any specific pixel of the display can be addressed by application of signals within predetermined ranges to each of the three addressing means associated with said specific pixel.
- [c2] An electronic display according to claim 1 wherein the pixels are arranged in a plurality of sub-arrays, each pixel within any specific sub-array being associated with one of the first and second sets of addressing means, the third set of addressing means having the form of a plurality of switching means, at least one of said switching means being associated with each of said sub-arrays, the switching means associated with each sub-array having an off state, in which signals on at least one of the first and second sets of addressing means are prevented from reaching the associated sub-array, and an on state, in which signals from both the first and second sets of addressing means are permitted to reach and address the associated sub-array.
- [c3] An electronic display according to claim 2 further comprising control means arranged to control the switching means so that only the switching means associated with one sub-array is in its on state at any given moment.
- [c4] An electronic display according to claim 2 wherein each sub-array comprises a discrete page, the pages formed by the plurality of sub-arrays being stacked on top of each other so that the entire display forms a multi-page electronic book.
- [c5] An electronic display according to claim 4 further comprising conductive vias extending between adjacent pages and connecting at least one of the first and second sets of addressing means on said adjacent pages.
- [c6] An electronic display according to claim 1 wherein the first second and third sets of addressing devices all have the form of electrical conductors and/or electronic devices.
- [c7] An electronic display according to claim 1 wherein at least one of the sets of

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addressing devices comprises a photoconductor.

- [c8] An electronic display according to claim 7 further comprising a light source associated with the photoconductor and selectively operable to switch the photoconductor between a conductive and a non-conductive state.
- [c9] An electronic display according to claim 7 further comprising a light source associated with the photoconductor and a light valve disposed between the light source and the photoconductor and arranged to control transmission of light from the light source to the photoconductor.
- [c10] An electronic display according to claim 9 wherein the light valve comprises a polymer-dispersed liquid crystal.
- [c11] An electronic display according to claim 9 wherein the light source comprises an electroluminescent material.
- [c12] An electronic display according to claim 9 comprising a plurality of light sources arranged as a series of elongate rows, and a plurality of light valves arranged as series of elongate columns crossing said elongate rows, said light sources and light valves together defining a two-dimensional array of pixels in said photoconductor.
- [c13] An electronic display according to claim 9 having the form of a plurality of pages stacked on top of one another to form a multi-page electronic display, and wherein each page has a single light source and a single light valve, so that the page or pages to be written at any given moment are selected by controlling the state of the light valves.
- [c14] An electronic display according to claim 9 wherein the first addressing means comprises a plurality of electrical conductors and means for applying potentials selectively to said conductors, the second addressing means comprises a plurality of light emitting devices and means for generating light selectively from said light emitting devices, and said third addressing means comprises a plurality of light valves and means for selectively setting said light valves to their transmissive or non-transmissive states.

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- [c15] An electronic display according to claim 1 having three sets of pixels arranged to display different colors, and wherein the third set of addressing means is arranged to select one of said three sets of pixels to be addressed at any given moment.
- [c16] An electronic display according to claim 1 further comprising a fourth set of addressing means for addressing said pixels, said fourth set being separate from said first, second and third sets of addressing means, each of said pixels of said display being associated with one addressing means in each of said four sets, such that any specific pixel of the display can be addressed by application of signals within predetermined ranges to each of the four addressing means associated with said specific pixel.
- [c17] An electronic display according to claim 1 wherein the electro-optic material comprises an electrophoretic medium.
- [c18] An electronic display according to claim 17 wherein said electrophoretic medium is an encapsulated electrophoretic medium.
- [c19] An electronic display according to claim 1 wherein the electro-optic material comprises a rotating bichromal object material.
- [c20] An electronic display according to claim 1 wherein the electro-optic material operates by principle of one of the following: rotating bichromal objects, electrochromics, or suspended particles.
- [c21] An electronic display comprising an electro-optic material having a plurality of separately addressable pixels wherein the number of driver outputs to the pixel array is less than the square root of the number of pixels.
- [c22] A method of addressing an electronic display, the method comprising:
 - providing an electro-optic material having a plurality of pixels;
 - providing first, second and third sets of addressing means for addressing said pixels, each of said pixels being associated with one addressing means in each of said three sets; and
 - applying predetermined signals to the three addressing means associated with a

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specific pixel, thereby addressing said pixel.

- [c23] A method of addressing a bistable electronic display having a plurality of pixels arranged in any array comprising a plurality of rows and plurality of columns, the method comprising selecting a plurality of rows or columns and applying a simultaneous and equivalent switching impulse to all selected rows and columns.
- [c24] A method of addressing a bistable electronic display having a plurality of pixels arranged in a plurality of rows, the method comprising:
(a) comparing a starting state of the display with a desired finishing state and determining for each pixel a change value representative of the change needed to change the starting state of that pixel to its desired finishing state; and
(b) calculating from the pixel change values for each row, a switch direction value for that row, said switch direction value representing the value for which, if all pixels in that row were changed by the switch direction value, the row switch time required to switch the row to the desired finishing state would be minimized.
- [c25] A method according to claim 24 further comprising any one or more of the following steps:
(c) calculating the average switch direction value for all rows of the display;
(d) identifying all rows with switch direction values less than the average switch direction value calculated in step (c);
(e) calculating the average switch direction value of all rows identified in step (d);
(f) applying to all rows identified in step (d) an impulse sufficient to cause a change in state equal to the average switch direction value calculated in step (e);
(g) identifying all rows with switch direction values greater than the average switch direction value calculated in step (c);
(h) calculating the average switch direction value of all rows identified in step (g); and
(i) applying, to all rows identified in step (g), an impulse sufficient to cause a change in state equal to the average switch direction value calculated in step

(g).

- [c26] A method of addressing a bistable electronic display having a plurality of pixels, each of said pixels having a first display state, a second display state differing in at least one optical characteristic from the first display state, and a plurality of intermediate states having values of said optical characteristic intermediate those of said first and second display states, the method comprising:
driving all the pixels of the display to the same one of said intermediate states;
and
thereafter addressing said pixels individually to drive them to their desired states.
- [c27] A method according to claim 26 wherein the intermediate state to which all the pixels are driven is such that substantially the same size of impulse is necessary to drive any pixel from said intermediate state to said first and second display states.
- [c28] A method of addressing a bistable electronic display having a plurality of pixels arranged in a plurality of rows and columns, the method comprising:
(a) comparing a starting state of the display with a desired finishing state and determining for each pixel a change value representative of the change needed to change the starting state of that pixel to its desired finishing state;
(b) comparing the change values of pixels in differing rows but the same column and locating at least two of said pixels having the same change value;
and
(c) addressing said at least two pixels having the same value simultaneously by addressing the rows and the column on which said pixels are located.
- [c29] A method of addressing a bistable electronic display having a plurality of pixels, the method comprising:
comparing a starting state of the display with a desired finishing state and determining which pixels differ between the two states; and
addressing only those pixels which differ between the two states.
- [c30] A method of addressing a bistable electronic display having a plurality of pixels,

which method comprises:

providing an array of island capacitors associated with the pixels of the display; through passive matrix XY addressing, introducing electrical charge into the capacitors in a pattern matching the image desired on the display; and thereafter allowing the charges on the capacitors to complete the addressing of the pixels of the display.

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